

Remarks

Claims 8 and 13-14 have been amended as to form.

Claims 8, 11 and 12 were rejected as unpatentable over CHANG et al. 5,578,527 in view of POTTER et al. 6,444,563. Reconsideration and withdrawal of the rejection are respectfully requested.

Claim 8 provides, among other features, that each of the reinforcing pads has a respective periphery adjacent to each respective one of the plural first solder balls that is at least semicircular when seen in plan view. This is illustrated, by way of example, in Figures 5A and 5B where it may be seen that the periphery of the pad adjacent to a solder ball is at least semicircular. As discussed in the specification at page 8, line 9 through page 9, line 10, this arrangement reduces the concentration of mechanical stress on the reinforcing pad and reduces the likelihood of inadvertent removal of the reinforcing pad.

As acknowledged in the Official Action, CHANG et al. do not disclose pads that are at least semicircular, and the Official Action relies on POTTER et al. for the suggestion to modify CHANG et al. so that the pads are at least semicircular.

POTTER et al. disclose a reinforcing pad with only one solder ball. Note that the four pieces of solder in Figure 5 (Before Reflow) merge into one solder ball as shown in Figure 5

(After Reflow). POTTER et al. do not make any suggestion regarding the shape of reinforcing pad with plural solder balls. Accordingly, POTTER et al. do not suggest modifying a reinforcing pad that has a respective periphery adjacent to each respective one of the plural first solder balls that is at least semicircular when seen in plan view, and thus the proposed combination would not make the invention of claim 8 obvious.

Further, even if one of skill in the art were to modify CHANG et al. to have a round reinforcing pad (by inaccurately taking the "Before Reflow" drawing in POTTER et al. out of context), the result would be one round pad with four solder balls. This does not meet the limitation of claim 8 because the round reinforcing pad would not have a respective periphery adjacent to each respective one of the four solder balls that is at least semicircular when seen in plan view.

Claim 12 is further distinguishable because the combination does not disclose or suggest the respective periphery that is semicircular (claim 8 includes "at least semicircular" and claim 12 includes "not more than semicircular." There is nothing in either reference to suggest this peripheral shape next to each of the solder balls.

Claims 10, 12 and 14 were rejected as unpatentable over CHANG et al. in view of DARVEAUX et al. 6,201,305.

Reconsideration and withdrawal of the rejection are respectfully requested.

Initially, it is noted that claim 8, from which claims 10 and 12 depend, was not rejected over these references and thus the rejection of claims 10 and 12 is improper (i.e., since claim 8 is patentable over these two references and since these claims include the subject matter of claim 8, these claims are also patentable over these two reference by virtue of their dependence on claim 8).

Further, claim 10 includes features that are independently patentable. Claim 10 includes reinforcing pads that are generally V-shaped with at least solder balls thereon, each at respective distal end of the V-shaped reinforcing pad. This is illustrated, by way of example, in Figure 5B.

The shortcomings of CHANG et al. are discussed above. DARVEAUX et al. disclose a reinforcing pad that is X-shaped and includes only one solder ball at a middle thereof. DARVEAUX et al. place the single solder ball at the middle of the X-shaped reinforcing pad to improve the positional tolerance of the solder ball placement (column 5, lines 5-9). If one of skill in the art were to combine this reference with CHANG et al., each solder ball would be placed at a center of a single X-shaped pad. One of skill in the art would not deviate from this arrangement because this would negate one of the explicitly recited

advantages, namely the improved positional tolerance of the solder ball. Accordingly, one of skill in the art would not learn from this combination that solder balls should be at the distal ends of a V or X-shaped reinforcing pad.

Claim 14 also includes the V-shaped reinforcing pad with the solder balls at the distal ends, and is patentable for the reasons just given regarding claim 10.

Claim 14 further provides that the respective periphery of each reinforcing pad adjacent to each respective one of the solder balls has a roundness in line with an outer diameter of the respective solder ball and that is at least semicircular when seen in plan view. DARVEAUX et al. includes a single solder ball that is significantly larger than the rounded distal ends of the X-shaped reinforcing pad and thus if a solder ball were placed at the distal end (applicant denies that there is any suggestion to do this, and presents alternative this by way of argument only), the reinforcing pad distal end could not have a roundness in line with the outer diameter of the solder ball. The size difference is too great. Modifications to force DARVEAUX et al. and CHANG et al. to fit the claims herein would be hindsight application of that which has only been taught by the present applicant.

The Official Action notes at page 4 (paragraph 12) that providing reinforcing pads of any shape, including semicircular, would be design choice because the applicant has not disclosed

that the shape is critical. This is not correct. As discussed in the specification at page 8, line 9 through page 9, line 10, the specific shapes and arrangements claimed herein reduce the concentration of mechanical stress on the reinforcing pad and reduce the likelihood of inadvertent removal of the reinforcing pad. The "at least semicircular" shape reduces the concentration of mechanical stress compared to shapes that include acute angles portions (page 8, lines 3-5 and page 9, lines 4-5).

Claims 8, 11 and 12 were rejected as unpatentable over CHIU 5,955,784 in view of POTTER et al. Reconsideration and withdrawal of the rejection are respectfully requested.

The Official Action acknowledges that CHIU does not disclose the reinforcing pads that are at least semicircular, and relies on POTTER et al. for the suggestion to modify CHIU.

As discussed above, POTTER et al. disclose a reinforcing pad with only one solder ball, where four pieces of solder in Figure 5 (Before Reflow) merge into one solder ball as shown in Figure 5 (After Reflow). POTTER et al. do not make any suggestion regarding the shape of reinforcing pad with plural solder balls. Accordingly, POTTER et al. do not suggest modifying a reinforcing pad that has a respective periphery adjacent to each respective one of the plural first solder balls that is at least semicircular when seen in plan view, and thus

the proposed combination would not make the invention of claim 8 obvious.

Further, even if one of skill in the art were to modify CHIU to have a round reinforcing pad (by inaccurately taking the "Before Reflow" drawing in POTTER et al. out of context), the result would be one round pad with four solder balls. This does not meet the limitation of claim 8 because the round reinforcing pad would not have a respective periphery adjacent to each respective one of the four solder balls that is at least semicircular when seen in plan view.

Claim 12 is further distinguishable because the combination does not disclose or suggest the respective periphery that is semicircular (claim 8 includes "at least semicircular" and claim 12 includes "not more than semicircular." There is nothing in either reference to suggest this peripheral shape next to each of the solder balls.

Claims 9, 10 and 13-14 were rejected as unpatentable over CHIU in view of DARVEAUX et al. Reconsideration and withdrawal of the rejection are respectfully requested.

Again, it is noted that claim 8, from which claims 9 and 10 depend, was not rejected over these references and thus the rejection of claims 9 and 10 is improper (i.e., since claim 8 is patentable over these two references and since these claims include the subject matter of claim 8, these claims are also

patentable over these two reference by virtue of their dependence on claim 8).

Further, claims 9 and 10 include features that are independently patentable. Claim 9 includes reinforcing pads that are generally X-shaped with four solder balls thereon, each at a respective distal end thereof. This is illustrated, by way of example, in Figure 5A. Claim 10 includes reinforcing pads that are generally V-shaped with at least solder balls thereon, each at respective distal end of the V-shaped reinforcing pad. This is illustrated, by way of example, in Figure 5B.

The shortcomings of CHIU are discussed above. DARVEAUX et al. disclose a reinforcing pad that is X-shaped and includes only one solder ball at a middle thereof. DARVEAUX et al. place the single solder ball at the middle of the X-shaped reinforcing pad to improve the positional tolerance of the solder ball placement (column 5, lines 5-9). If one of skill in the art were to combine this reference with CHANG et al., each solder ball would be placed at a center of a single X-shaped pad. One of skill in the art would not deviate from this arrangement because this would negate one of the explicitly recited advantages, namely the improved positional tolerance of the solder ball. Accordingly, one of skill in the art would not learn from this combination that solder balls should be at the distal ends of a V or X-shaped reinforcing pad.

Claims 13-14 also include the X and V-shaped reinforcing pads with the solder balls at the distal ends, and are patentable for the reasons just given regarding claims 9-10.

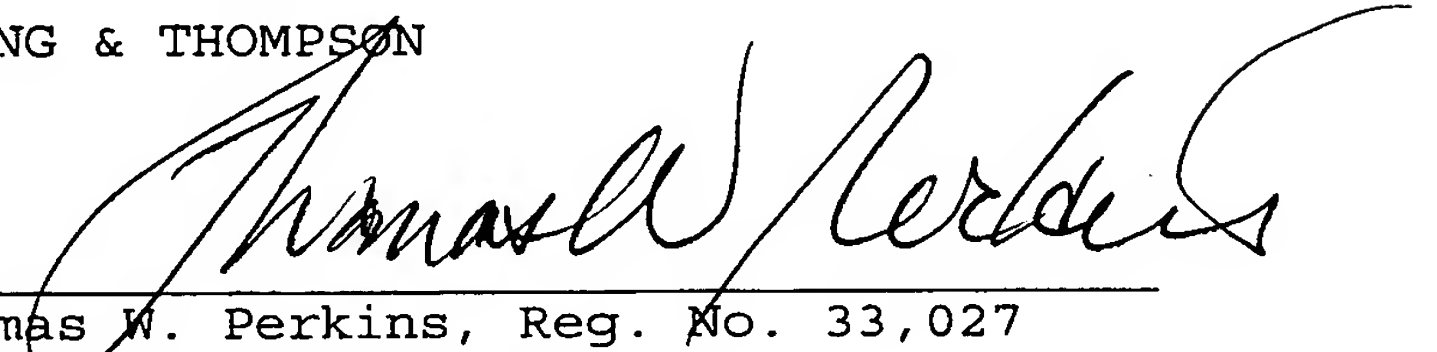
Claims 13-14 further provide that the respective periphery of each reinforcing pad adjacent to each respective one of the solder balls has a roundness in line with an outer diameter of the respective solder ball and that is at least semicircular when seen in plan view. DARVEAUX et al. include a single solder ball that is significantly larger than the rounded distal ends of the X-shaped reinforcing pad and thus if a solder ball were placed at the distal end (applicant denies that there is any suggestion to do this, and presents alternative this by way of argument only), the reinforcing pad distal end could not have a roundness in line with the outer diameter of the solder ball. The size difference is too great. Modifications to force DARVEAUX et al. and CHIU to fit the claims herein would be hindsight application of that which has only been taught by the present applicant.

In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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